Office of Operating Experience Analysis, EH-33 • U.S. Department of Energy • Washington, D.C. 20585

OPERATING EXPERIENCE
WEEKLY SUMMARY

Office of Nuclear and Facility Safety

September 10 - September 16, 1999

Summary 99-37

Operating Experience Weekly Summary 99-37

September 10 - September 16, 1999

Table of Contents

Visit Our Website

The Weekly Summary is available, with word search capability, via the Internet at **http://tis.eh.doe.gov/web/oeaf/oe_weekly/oe_weekly.html**. If you have difficulty accessing the Weekly Summary at this URL, please contact the ES&H Information Center, 1(800) 473-4375, for assistance. If you have additional pertinent information or identify inaccurate statements in the summary, please bring this to the attention of Jim Snell, (301) 903-4094, or e-mail address jim.snell@eh.doe.gov, so we may issue a correction.

EVENTS

1. LOCKOUT/TAGOUT VIOLATION DURING A CRITICAL LIFT

On August 31, 1999, at the Paducah Gaseous Diffusion Plant, a subcontractor crane operator performed a critical lift of a 3,700-lb GeoProbe® over active piping systems at a laboratory area without a required lockout/tagout on the piping. The piping contains propane, oxygen, electrical lines, and other pressurized gases and runs approximately 3 feet above grade. The building custodian had issued a lockout/tagout permit on the piping for the duration of the lift, and the GeoProbe operator had signed the permit. Prior to the critical lift, the custodian notified the prime contractor and the GeoProbe operator that he received a request to place the piping back into service. Facility personnel removed the lockout/tagout from the piping. However, site supervisors did not communicate this change in job condition to the subcontractor crew or the crane operator, resulting in a critical lift over the piping without the lockout/tagout in place. Additionally, the subcontractor person-in-charge (PIC) was not present during the lift. A mishap or accident during the lift could have ruptured the piping and caused serious facility damage and personnel injury. (ORPS Report ORO--BJC-PGDPENVRES-1999-0016)

Investigators determined that the crane operator made a practice lift the previous day to evaluate the center of gravity and the critical lift plan and to demonstrate the lifting crew's ability to perform the lift safely. The operator performed the practice lift in another open area of the site and used sawhorses to simulate the location and position of the piping system. Investigators also determined that the original work plan required the piping to be out of service until after the actual lift was performed. However, the building custodian required the lines to be in service to support an inspection of the laboratory by the Nuclear Regulatory Commission. When the actual lift occurred, the GeoProbe operator, who was not a member of the lift crew, was not present and was attempting to have the lockout/tagout restored. Subcontractor health and safety officers, who were at the lift site, assumed that the lockout/tagout was still in place and did not intervene to stop the crane operator from lifting the GeoProbe over the laboratory piping. Investigators also determined that site supervisors and the lifting crew did not hold a meeting to discuss safety requirements and precautions immediately before the lift. Corrective actions implemented by subcontractor supervisors included developing a checklist used by the health and safety officers each morning to reverify work-site conditions and conducting crew reviews of the site lockout/tagout and hoisting and rigging procedures.

This event illustrates the importance of properly communicating changes in work-site conditions and the risk of assuming that established safety conditions have not changed. Lockout/tagout programs protect personnel from injury, protect equipment from damage, and maintain plant systems. Workers should always ensure that required lockouts and tagouts are installed before starting work to verify that isolation and de-energization have been correctly accomplished. For critical lifts, a meeting involving lift participants is required prior to performing the lift. At that meeting, the critical-lift plan/procedure is reviewed, and all safety requirements and precautions are verified. If the site supervisors, health and safety officers, and the lifting crew at Paducah had held a safety meeting before the critical lift, the change in job condition would have been communicated to the crew and this event would not have occurred.

DOE-STD-1090-99, *Hoisting and Rigging*, provides guidance for hoisting and rigging and identifies related codes, standards, and regulations. Chapter 2, "Critical Lifts," states that a lift shall be designated as critical if dropping the load could result in (1) an unacceptable risk of personnel injury or a significant adverse health impact, (2) significant release of radioactive or other hazardous materials, (3) undetectable damage that would jeopardize future operations or facility safety, or (4) damage that would cause an unacceptable delay in the schedule or have another significant impact on the program. The standard also requires that a PIC of the critical lift be appointed. The PIC is responsible for ensuring a plan or procedure is prepared that includes critical lift operating procedures and special instructions for the lifting crew, including precautions and safety measures to be followed. DOE-STD-1090-99 can be found at http://tis-nt.eh.doe.gov/techstds/standard/ appframe.html.

DOE O 5480.19, *Conduct of Operations Requirements for DOE Facilities,* Chapter IX, "Lockouts and Tagouts," requires a supervisor or appropriate manager to notify affected personnel of the application and removal of lockout/tagout devices. Notification should be given before the devices are applied and after they are removed. DOE O 5480.19 can be found at http://www.explorer.doe.gov:1776/htmls/currentdir.html.

KEYWORDS: hoisting and rigging, industrial safety, lockout and tagout

FUNCTIONAL AREAS: Conduct of Operations, Hoisting and Rigging, Industrial Safety

2. LIFTING HOOK DEFORMED WHEN LOAD EXCEEDS RATED CAPACITY

On September 7, 1999, at the Argonne National Laboratory—West, operators discovered a deformed slide-on accessory hook whose hook throat opened up to about 45 degrees. The operators were preparing to perform a small lift using the accessory hook, which fits over the auxiliary hook of a 5-ton overhead crane located in the Hot Fuel Examination Facility Hot Repair Area (HRA). Upon discovering the deformity, they stopped work and notified the facility manager. Sometime before the deformed hook was discovered, two other operators had accidentally used the 500-lb-rated hook in an attempt to move a 9,000-lb shielded cask. They had inspected the hook before the lift but did not check its rating. They also did not know the weight of the load. The accessory hook is designed to slip over the larger hook of the HRA auxiliary crane to allow for the attachment of smaller rigging to the auxiliary hook. Lifting a load whose weight exceeds the rated capacity (maximum working load permitted) of the rigging can result in dropped loads, equipment damage, and personnel injury. (ORPS Report CH-AA-ANLW-HFEF-1999-0006)

The operators who had deformed the accessory hook were tasked with moving the shielded cask with the 5-ton crane and the auxiliary hook (considered an ordinary lift). They neglected to review the procedure for the cask or the rigging diagram and, therefore, did not know the weight of the cask. Although an operator did inspect the hook for damage, he did not notice the working load of 500 lb, which was both stamped and stenciled on the hook. The crane operator, who was located outside of the HRA (a distance of 20 feet), did not recognize that the accessory hook was installed on the crane hook. When he realized that the cask did not move during the attempted lift and that the hook appeared deformed, he immediately released the strain on the slings and directed the operator inside the HRA to remove the accessory hook. Because the operator inside the HRA was not familiar with the original configuration of the hook, he did not realize it was deformed when he removed it. He then re-attached the rigging to the auxiliary crane hook, and the cask was lifted and moved without further incident.

Investigators believe that the accessory hook was inadvertently deformed when the weight of the shielded cask overloaded the rigging. They determined that the crane operator failed to stop the work when he realized the hook was deformed and that he also failed to notify his supervisor of the incident. Also, the pre-use inspection of the rigging was performed by the operator in the HRA and not by the crane operator, who was in charge and responsible for ensuring that the rigging configuration was in accordance with the rigging sketch and approved procedures. The deformed accessory hook was taken out of service and can no longer be used. The integrity and use of the HRA 5-ton auxiliary overhead crane was not affected by this incident.

This event underscores the value of conducting a pre-use inspection of the rigging hook as performed by the operators who identified the deformed accessory hook. The inspection should include: (1) checking for distortions such as bending and twisting that exceeds 10 degrees from the plane of the hook and 10 degrees from the point of the hook to the plane of the center axis of the hook, (2) checking for an increase in hook throat opening that exceeds 15 percent of the original opening (most hooks have punch marks as reference points), (3) checking for wear in the saddle and eyelet area that exceeds 10 percent of the original dimension, (4) checking for cracks, severe nicks, and gouges, and (5) checking the hook attachment for defects. Figure 2-1 shows inspection points for a rigging hook.

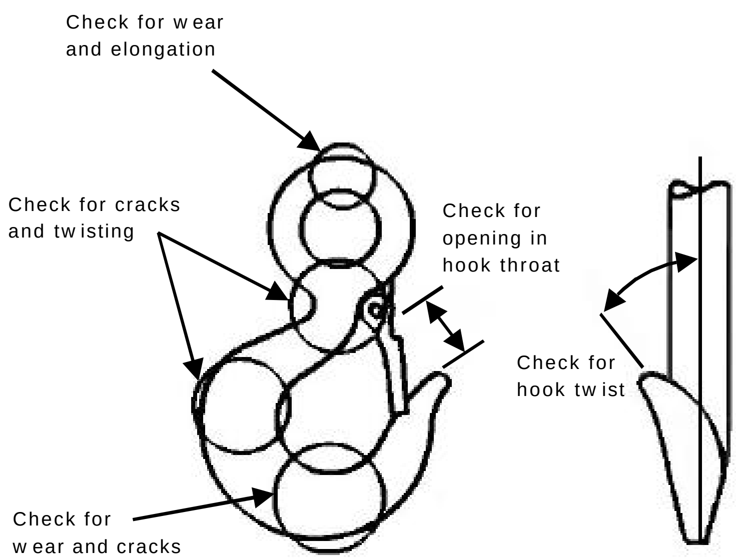

Figure 2-1. Rigging Hook Inspection Points

NFS has reported other events in the Weekly Summary in which the weight of the load exceeded the capacity of the rigging. Some examples follow.

- Weekly Summary 99-31 reported that a ½-inch wire-rope sling broke into two pieces at the Sandia National Laboratory—Albuquerque while a contractor was lifting a 15-ft by 25-ft door assembly. The load dropped approximately two feet damaging an electrical box and bending some support framing. Investigators determined that the sling was rated for 3,200 lb, but the load weighed approximately 9,800 lb. The contractor's riggers assumed the door assembly weighed approximately 3,000 lb. (ORPS Report ALO-KO-SNL-1000-1999-0006)

- Weekly Summary 96-07 reported that the wrong capacity sling was used to rig and hoist a transfer cask shield ring at the Argonne National Laboratory—West Hot Fuel Examination Facility. A crane operator and a technician used a three-leg wire-rope sling that was not normally used for that operation. A tag on the sling indicated that the rated capacity was 2,500 lb. However, the shield ring weighed 5,200 lb. Investigators determined that the crane operator and the technician did not check the load weight and capacity of the rigging before lifting the shield ring. (ORPS Report CH--AA-ANLW-HFEF-1996-0001)

These events illustrate the dangers associated with using rigging that does not have the rated capacity to handle the intended load. It is also important to know the weight of the load. The person in charge, the crane operator, and the riggers must be very attentive to ensure that lifts are performed safely. Failures of rigging or hoisting fixtures are dangerous, not only because of dropped loads, but also because they can create missile hazards. DOE-STD-1090-99, *Hoisting and Rigging*, provides guidance for hoisting and rigging and identifies related codes, standards, and regulations. The following sections and chapters of the standard apply to this event.

- Section 7.5.5, “Size of Load,” states that the weight of the load shall be determined before making the lift. This section also states that crane and rigging equipment shall not be loaded beyond its rated capacity, except for authorized testing described in section 7.3.

- Section 7.5.8, “Ordinary Lifts,” states that personnel should ensure that the weight of the load is determined, that proper equipment and accessories are selected, and that the rated capacity is not exceeded.

- Chapter 12, “Rigging Accessories,” provides requirements for inspecting, testing, and using shackles, eyebolts, rings, wire-rope clips, turnbuckles, rigging hooks, and load-indicating devices used in hoisting and rigging. It states that an operator or other designated person shall visually inspect rigging accessories at the beginning of each work shift or before use. It also states that a designated person shall determine whether conditions found during the inspection constitute a hazard and whether a more detailed inspection is required.

- Chapter 13, “Load Hooks,” describes safety standards for inspecting, testing, and maintaining load hooks installed on cranes or hoists and implements the requirements of ASME B30.10, chapter 10-1, “Hooks.”

KEYWORDS: hoisting and rigging, industrial safety, lifting device, rigging

FUNCTIONAL AREAS: Hoisting and Rigging, Industrial Safety

3. PIPEFITTER CUTS STEAM LINE CHARGED WITH COMPRESSED AIR

On August 31, 1999, at the Pacific Northwest National Laboratory (PNNL), a pipefitter cut into a 3-inch carbon steel steam line that was pressurized with 100-psig compressed air. He immediately stopped cutting when he heard a hissing noise. The pipefitter, using a portable band saw, was performing demolition work on what he believed was an abandoned steam line. The pipefitter and his supervisor determined that the steam line was charged with compressed air. No one on the building core team, which consisted of the building manager, the facility project manager, and a work control specialist, knew that another organization had modified the abandoned steam line for use as an air supply line. Also, no one on the core team verified the status of the line before performing work. System modifications that are not adequately communicated to affected facilities may result in workers being exposed to unanticipated hazardous energy sources. (ORPS Report RL--PNNL-PNNLBOPER-1999-0027)

On September 1, 1999, the facility manager held a critique. Attendees determined that on May 5, PNNL managers approved a facility modification permit to remove abandoned steam and condensate lines from building 3760. In July 1999, the operating contractor discovered an underground leak in the plant air grid. In August, the operating contractor modified the abandoned steam line in building 329 to re-route 100 psig plant air around the leak in the plant air grid. This modification was performed before submitting an engineering change notice or obtaining PNNL authorization. The abandoned steam line served buildings 329 and 3760. They also determined that the PNNL building 329 manager, PNNL facility engineers, and the PNNL utility operations supervisor knew that the abandoned steam line was charged with plant air; however, no one notified the building 3760 core team of this. They also determined that the engineering change notice required cutting and capping the steam line to building 3760 and re-labeling charged sections of the abandoned steam line; however, this work was not yet done.

As a corrective action, the facility manager will develop a work release procedure form which will be used to release work and establish as-left conditions. The procedure will apply to facility and services work that is performed by workers outside of the core team. The facility manager will also apprise building managers, facility project managers, work control specialists, and plant engineers of the existing “300 Area Contractors Responsibility Procedure.” This procedure lists services points of contact and emphasizes the need for communication between organizations before beginning work.

NFS has reported other events involving issues of work control and communicating system status between different organizations at DOE facilities. Following are some examples.

- Weekly Summary 98-31 reported that during decommissioning, operations workers at the Oak Ridge National Laboratory East Tennessee Technology Park discovered that a lube oil system in a shut-down gaseous diffusion plant contained approximately 3,400 gallons of oil. Investigators determined that decommissioning contractor personnel believed that the lube oil system contained only residual amounts of oil because the previous contractor reported draining the system as part of deactivation. (ORPS Report ORO--BNFL-K33-1998-0003)

- Weekly Summary 96-18 reported that two pipefitters at the Savannah River Site were splashed with a 50-percent sodium hydroxide solution when cutting a transfer line from a tank. When the pipefitters made a cut in the pipe near a low point hidden by lagging, the sodium hydroxide spilled out causing minor skin irritation. The 30-foot pipe had a 3-inch dip near the middle that provided an area for solution to accumulate. Operators had drained and flushed the tank, but were unable to flush the transfer line. Although the Operations coordinator informed construction managers of these actions, the managers failed to inform the pipefitters. The event resulted from poor communication between operations and construction personnel, the industrial hygienists, and the work planners regarding the status of the transfer line. Investigators determined that supervisors did not identify the potential for residual solution in the line and did not discuss the hazards of caustic solutions. (ORPS Report SR--WSRC-FCAN-1996-0006)

These events illustrate the importance of ensuring that demolition work includes a thorough characterization of facility and equipment conditions. When planning work on or near abandoned systems or components, available documentation of the system's status and usage may not be complete. When organizations outside of the facility organization perform work on interfacing systems, good communication and work control practices can prevent hazards associated with unforeseen system status and poor configuration control. The status of systems must be known to identify and mitigate hazards. Work release procedures are needed to ensure that operational and safety boundaries are maintained during the performance of work and that the status of the systems is known at the end of the work. Work that affects other organizations’ systems must be coordinated with those organizations and approved before the work is started. Before dismantling or segmenting any component, all hazardous energy sources to the component, e.g., air, water, steam, or electric power must be disconnected and a zero energy check must be performed.

This event also demonstrates the importance of multiple engineered barriers to prevent hazardous events. Although human performance (supported by procedures, policies, memoranda, or standing orders) is a standard barrier to pressurized component hazards, the probability of prevention can be increased by adding physical barriers such as lockouts and tagouts. Lockout/tagout program elements, such as zero energy checks, are described in 29 CFR 1910, *Occupational Safety and Health Standards*, and DOE O 5480.19, *Conduct of Operations Requirements for DOE Facilities.*

Facility managers should ensure that each new, existing, or modified system at their facility has been analyzed and managed in accordance with the core functions of DOE G 450.4-1, *Integrated Safety Management System Guide*. These core functions are as follows: define the scope of work, analyze hazards, develop and implement controls, perform work in accordance with controls, and integrate feedback and improvement. The guide states that the core functions, along with guiding principles, apply to the planning and performance of all types of potentially hazardous work, including construction, operation, and decommissioning. DOE-STD-1120-98, *Integration of Environment, Safety, and Health into Facility Disposition Activities*, provides guidance for enhancing worker, public, and environmental safety. It supports Integrated Safety Management System principles to guide the safe accomplishment of work activities. These principles include (1) line management responsibility for safety, (2) clear roles and responsibilities, (3) competence commensurate with responsibilities, (4) balanced priorities, (5) identification of safety standards and requirements, (6) hazard controls tailored to work being performed, and (7) operations authorization. Integrated Safety Management System information can be found at http://tis-nt.eh.doe.gov/ism.

KEYWORDS: configuration control, hazard analysis, industrial safety, pre-job planning

FUNCTIONAL AREAS: Configuration Control, Integrated Safety Management

4. EPA CAUTIONS AGAINST INADEQUATE MATERIAL SAFETY DATA SHEETS

This week, OEAF engineers reviewed an Environmental Protection Agency (EPA) Chemical Safety Alert entitled, “Use Multiple Data Sources for Safer Emergency Response.” According to the EPA, Material Safety Data Sheets (MSDSs) may provide sufficient information to respond effectively and safely to accidental releases, fires, and other emergencies involving hazardous materials. Individual MSDSs may contain incomplete or inaccurate data, and different MSDSs for the same material may contain conflicting information. Although the EPA alert focuses on the needs of emergency responders, OEAF engineers believe that it contains valuable information for industrial hygienists, work planners, and process engineers. (EPA-F-99-006, June 1999)

OSHA Standard 1910 CFR 1200, *Hazard Communication*, provides standards to ensure that workers receive information about the dangers of toxic or hazardous substances that they may be exposed to and protective measures for working safely with those substances. Section (g) of the standard provides criteria for developing MSDSs, an important vehicle for communicating chemical hazards to employees. The standard requires chemical manufacturers to provide new and updated MSDSs to their distributors, who must, in turn, provide them to their customers. OSHA requires MSDSs to address chemical identity, the chemical and common names of all hazardous constituents, physical and chemical characteristics, fire and explosion hazards, reactivity hazards, health hazards, precautions for safe handling, and control measures.

The EPA cautions that MSDSs from different sources for the same material may differ widely in their descriptions of hazards. They cite a comparison of four different MSDSs for the compound azinphos methyl. Hazard ratings for health/fire/reactivity were listed as 2/0/0, none listed, 3/2/2, and 4/0/0 in the MSDSs, where a higher number indicates a greater hazard. All four MSDSs also exhibited wide disparity in their narrative descriptions of reactivity hazards, incompatibilities, and fire hazards. For example, one MSDS described incompatibles as “acids and bases” while another described incompatibles as “heat, moisture.” None of the MSDSs were entirely consistent with a Response Information Data Sheet developed by the National Oceanic and Atmospheric Administration and the EPA.

The EPA also cautions that although MSDSs describe the hazards associated with a particular product, integrating a product into a process can result in the increase, decrease, or elimination of hazards by reactions with other chemicals, changes in temperature or pressure, or changes in physical or chemical properties. For example, NFS reported in Weekly Summary 99-33 that OSHA cited a chemical manufacturer for several serious and willful violations of OSHA safety standards in connection with an explosion in a hydroxylamine-distilling unit that killed five persons. One of OSHA’s citations noted that “Each Material Safety Data Sheet (MSDS) did not contain the physical hazards of the hazardous chemical, including the potential for fire, explosion, and reactivity … ” The MSDS described the relatively benign characteristics of the final product, a 50-percent solution by weight of hydroxylamine in pure water. In contrast, the distilling column contained greater than 80 percent of hydroxylamine by weight in the presence of high concentrations of potassium sulfate. It is also known that crystalline hydroxylamine, which is extremely reactive at room temperature, had been observed in some parts of the distiller piping. The reactivity of hydroxylamine increases with temperature, concentration, and the presence of catalytic impurities.

Facility personnel should also be aware that MSDSs may list and describe only the constituents in a product that are generally considered as heath hazards. Products may contain non-hazardous constituents that may affect processes. For example, analytical field services personnel at the Hanford Site reviewed the MSDS for a sealant to determine if it had the potential to contaminate sample containers and sampling equipment with volatile organic compounds. They discovered that the MSDS included only the chemicals that are health hazards. Laboratory analysts determined that the sealant contained a significant quantity of organic compounds that were not listed on the MSDS. The cost to the facility to dispose of and replace contaminated sampling equipment was approximately $18,000. (ORPS Report RL--BHI-GENAREAS-1999-0002)

The EPA advises emergency responders and emergency planners to use additional sources of chemical information to characterize hazards and develop response plans. The EPA's Chemical Safety Alert, available at www.epa.gov/ceppo/, lists several sources of assistance and supplemental information for local emergency responders and others.

NFS has reported inadequacies in MSDSs in other Weekly Summaries.

- An Army Industrial Hygiene Program newsletter reported the results of a study in which only 11 percent of 150 MSDSs reviewed provided accurate data on health effects, personnel protective equipment, exposure limits, and first aid measures. Fifty-one percent of the data sheets were at least partially accurate in these four categories. (Army Industrial Hygiene Program newsletter dated July 1995, Issue 3; American Industrial Hygiene Association Journal, February 1995, pp 178-183; OEWS 95-40)

- Employees at a Lodi, New Jersey facility were manufacturing a gold-precipitating agent when an explosion and fire destroyed the facility and killed five employees. An exothermic reaction, possibly from a leaking mechanical seal on a blender vessel, produced noxious gases and prompted the workers to unload the blender. During the unloading operation, an explosion propelled the vessel and its concrete supports approximately 48 feet and through two brick walls. OSHA investigators concluded, in part, that facilities who rely on MSDSs created by other organizations must be aware that the MSDSs for raw materials may not identify all hazards encountered when mixing or blending with other materials. (OSHA Hazard Information Bulletin; Weekly Summary 96-52)

KEYWORDS: chemicals, chemical reaction, emergency planning, hazard communication, safety

FUNCTIONAL AREAS: Chemistry, Emergency Planning, Industrial Safety

FINAL REPORTS

This section of the OEWS discusses events filed as final reports in the ORPS. These events contain new or additional lessons learned that may be of interest to personnel within the DOE complex.

1. RAISED BED OF DUMP TRUCK COLLIDES WITH OVERPASS

On January 26, 1999, a Savannah River Site heavy equipment operator sustained serious injuries when the raised bed of a 16-cubic-yard dump truck that the operator was driving collided with an overpass. The truck, which was returning from a job with approximately 12 tons of sand, had traveled about four miles before reaching a cloverleaf intersection. A witness driving a vehicle behind the dump truck observed the dump bed begin to rise as the truck began a right 270-degree turn. The witness observed the bed rising more quickly as the truck accelerated to approximately 30 miles per hour. He attempted unsuccessfully to alert the driver of the truck by flashing his vehicle's headlights and honking the horn. The fully raised dump body struck the nearest bridge girder squarely. Although a seat belt was worn, the operator was severely battered in the collision. Responding personnel transported the injured operator to the site medical facility, where the operator was treated and released the same day to a private physician's care. The operator missed several months of work while under medical care, continued physical therapy for several additional months, and has returned to full-time, medically limited duty. (ORPS Report SR--WSRC-CSWE-1999-0001; OEWS 99-05)

Upon impact, the dump bed sheared two hinge pins on the rear of the truck chassis and the connecting pin for the lift cylinder and came to rest inverted beneath the overpass (Figure 1-1). The front of the truck chassis raised into the air, slammed back down onto the pavement, and stopped approximately 200 feet further down the road. The impact with the pavement broke the shock mounts from the front axle, drove the engine and transmission through their mounts and into the pavement, bent the truck's frame, bent the rear tandem axle, and separated the two interior tires from their wheels on the rear axle (Figure 1-2).

Figure 1-1. Detached Dump Bed

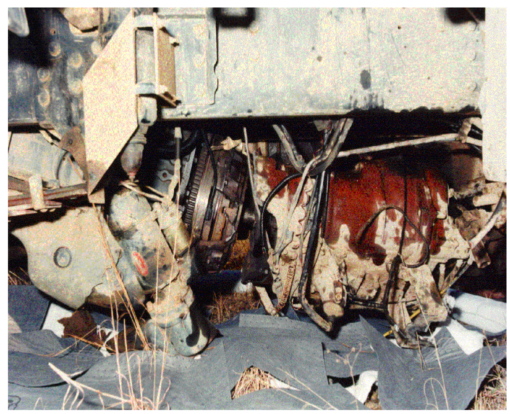

Figure 1-2. Chassis and Transmission

The truck, valued at $68,000, was a total loss. Repairs to the overpass, if performed, would have cost at least $300,000. Instead, site managers have elected to return the overpass to service and permanently barricade the merging lane on the overpass supported by the damaged girder.

Investigators determined that in order for the dump bed to raise, a power take-off control must be engaged to supply hydraulic oil and a dump-bed lever must be positioned to route the oil to the actuating cylinder. There are no engineered safety features to prevent operating the dump truck at highway speeds with the dump bed not fully seated. Manufacturers' labels warning of this condition are visibly posted in the cab. A power take-off engaged ("PTO IN") indicating light, located under the selector knob on the floor between the seats, is not visible to the driver when operating the vehicle (Figure 1-3). A "DUMP BED RAISED" indicating light on the dashboard is below the driver's field of vision during highway operation and is further obscured by a radio microphone cord (Figure 1-4). On this model of dump truck, the dump-bed lever is equipped with a spring-loaded safety pin to keep it locked in the center (neutral) position. Following the accident, investigators found the safety pin for this truck in the driver's door pocket of the cab. No driver remembers the safety pin having been in place, and no safety inspection report for this vehicle had ever noted its absence. However, inspectors determined that two dump trucks in the Savannah River Site fleet were not equipped with dump-bed lever safety pins and that the levers in two other trucks were so worn that the beds could be raised even with the pins in place.

Figure 1-3. Power Take-Off Control and Dump-Bed Lever

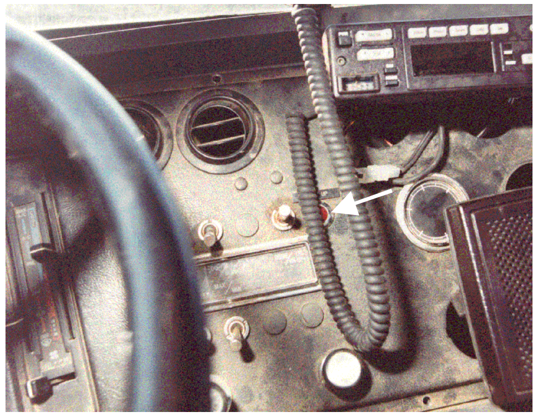

Figure 1-4. "DUMP BED RAISED" Indicating Light

With respect to the power take-off control, dump truck operators are instructed to always disengage the control before driving a truck onto the highway. During informal interviews with several drivers, none could claim never to have forgotten this critical step. The driver in this accident states that the power take-off control was disengaged or in the "OUT" position before the truck went on the road, and investigators found the control in that position following the accident.

With respect to the dump-bed lever, there were items of personal and government property present in the truck cab that may have made contact with the lever while the truck was on the highway. Because nothing was securing the position of the lever, it could have been moved inadvertently from the neutral position. This would have allowed the dump bed to raise if the power take-off was engaged. The dump-bed lever automatically returns to the neutral position to hold the bed up after it reaches the fully raised position. Investigators found the lever in the neutral position following the accident.

Inspectors found no conclusive evidence of mechanical failure during their post-accident inspection of the wrecked truck and could not determine the actual configuration of the power take-off control and dump-bed lever immediately prior to the accident.

Investigators attributed the direct cause of the accident to equipment problems. Engineered safety features were inadequate to prevent the dump bed from raising while the truck was operating at highway speed, and indicating lights were poorly located or obscured. Investigators defined the root and contributing causes as management problems. Managers compromised the safety of their employees by allowing complacent safety and hazard identification attitudes to develop for routine tasks. Operators filed incomplete post-trip inspection reports, and supervisors did not routinely review them to identify problems. Managers could not substantiate adequate operator knowledge of, or training in, the safety devices for this equipment. On-the-job training for operators did not include formal instruction in the purpose or use of safety locking pins, the intent of manufacturer's warning labels, the hazards associated with raising a dump bed in transit, or the actions to be taken if the situation occurs.

As an engineered corrective action, Savannah River Site personnel have installed an additional "DUMP BED RAISED " indicating light on top of the dashboard of each similar dump truck in the fleet. This redundant light is well within the driver's field of vision during highway operation but does not distract the driver during dumping operations.

Site personnel have completed the following additional corrective actions.

- Conducted special meetings for all drivers and heavy equipment operators to discuss this occurrence and the safety aspects of controls, warnings, and indicators.
- Inspected all dump trucks at the site to ensure that indicating lights work properly and safety locking pins are available.
- Revised post-trip inspection reports to document completion of pre-trip inspections and the operability of all vehicle safety devices.
- Revised the annual Department of Transportation inspection report to require documenting indicating light and safety locking pin functionality.
- Revised the driver training program to include the purpose and use of safety locking pins, the need for adherence to manufacturer's warning labels, and the risks associated with a raised dump truck bed in transit.
- Completed a job hazard analysis for dump truck operations.

KEYWORDS: accident, transportation, truck

FUNCTIONAL AREAS: Operations

2. HOSE ON PORTABLE HYDRAULIC HAND PUMP FAILS DURING USE

On June 23, 1999, at the Pantex Plant, a hydraulic hose separated from a portable hydraulic hand pump (or special tooling) while production technicians were dismantling a weapon. The separated hose sprayed hydraulic fluid on one of the production technicians and the surrounding area. The production technicians placed the weapon in a safe condition and cleaned up the hydraulic fluid from the pump, the walls, and the floor. The production technician who was sprayed with hydraulic fluid went to the site medical facility for evaluation. Investigators determined that the production technicians did not operate the pump in accordance with procedures and that the failed hose did not have the correct working-pressure rating for the pump. The incident did not result in safety hazards to personnel, personnel injuries, or damage to the facility. (ORPS Report ALO-AO-MHSM-PANTEX-1999-0046)

The portable hand pump is an Enerpac P-464 two-stage pump capable of producing 10,000 psi. It has two hoses that are connected by quick-disconnect fittings. A selector valve on the pump is labeled "up" and "down" corresponding to the direction of movement of a mid-plate disassembly fixture. The critical movement when using the special tooling is in the "up" position; therefore, a pressure gauge and a pressure relief valve are installed on the associated hose. The mid-plate disassembly fixture is a framework of aluminum that features a double-action hydraulic cylinder. The tooling is used at a maximum of 1,450 psi per nuclear explosive operating procedures, and the pressure relief valve is set at 1,495 psi maximum.

Facility personnel disassembled the portable hand pump valve and reservoir to inspect them for any foreign material or abnormalities. No abnormal wear or foreign material was found. The hydraulic fluid was clean and showed no signs of contaminants. They inspected other portable hand pumps and found that four of eight pumps had underrated hoses installed. These hoses were replaced.

Investigators determined that the direct cause of the incident was the incorrect use of the procedure for the hydraulic pump. The procedure instructs the production technicians to operate the pump with the selector valve in the "up" position. The production technicians' recall that the selector valve was in the "up" position at the time of the incident, but an engineering evaluation of the failure indicates that the only feasible scenario for the failure is that the selector valve was actually in the "down" position.

Investigators determined that there were two contributing causes for the event. The first contributing cause was a lack of attention to detail in that procurement personnel ordered the wrong hose for the portable hand pump. The bill of material (BOM) indicates that this pump requires a Parker Hannifin Medium Pressure Hydraulic Hose Assembly (part number 221-01-01-6-4-6-120). The design of the hand pump (from 1996) was based on the design of a similar hand pump from 1979. In particular, the hose part number from the earlier pump design was copied verbatim to the later pump design without verifying that it was still correct. After the hose failure, investigators determined that Parker had discontinued the 221 hose with a 2,250-psi working pressure and created another hose with a similar part number (221FR) with a 500-psi working pressure. When Parker received an order for a 221 hose, which no longer exists in their catalog, they assumed a 221FR hose was intended and supplied it instead. Thus, the hoses installed on the pump were 221FR hoses with a 500-psi working pressure. The second contributing cause was also a lack of attention to detail in that while verifying that the part number of the hose matched the one specified in the BOM, receipt inspectors had mistakenly accepted the hose as number 221 because the number molded on the case (221FR) was similar.

Investigators determined the root cause was inadequate or defective design in that the design of the hand pump had not anticipated that an operator could place the selector valve in the wrong position, thereby causing a hose to fail when the pump was operated. If the selector valve were in the correct position (“up”), the hose that failed would be the return line from the cylinder to the pump, which would only be exposed to a very low back-pressure from the hydraulic oil returning to the pump reservoir. However, if the selector valve were mistakenly placed in the "down" position, then the hose may be pressurized to failure because the pump would discharge into a closed volume and the pressure would rise rapidly. A 0 to 2,000-psi pressure gauge and a 1,450-psi pressure relief valve are connected to the hose that receives the pump discharge. The only over-pressure protection for the non-gauged hose is an internal relief valve in the pump, which is factory set at 10,000 psi.

Investigators identified the following corrective actions.

- Hold a stand-up meeting to re-emphasize the need to check the position of the selector valve on the pump before beginning this operation.

- Revise the tooling and machine design internal operating procedure to require complete identification of parts in the BOM on tooling drawings. For hardware or commercial items, the description should contain any critical information, such as pressure ratings for hydraulic or pneumatic hoses.

- Develop a department lessons-learned document that reviews the revision to the tool design drawing internal operating procedure. Lessons learned will also emphasize the importance of validating the part number and product description with current catalog information.

- Draft an action plan to accomplish a review of all hoses on hydraulic special tooling and to determine any enhancements to the tooling that may be appropriate to reduce the likelihood of incidents due to operator error.

- Hold a stand-up meeting with personnel involved in the receiving and inspection of tooling items. A Tooling and Design Department representative will explain the changes to the internal operating procedure and review lessons learned.

- Modify the hydraulic hand pumps by setting the internal relief valve to 1,900 psi and change the quick-disconnect fittings to allow for proper hose connection.

This event underscores the importance of attention to detail when following operational procedures, ordering and receiving parts, and designing tools. Procurement personnel should ensure that the BOM is accurate and that when parts are ordered, critical information is also provided along with the part number or catalog number to the supplier or manufacturer. Also, when the parts are received, receipt inspectors should verify part numbers as well as the specified critical information.

KEYWORDS: hose, hydraulic, inspection, operations, procedures, procurement, pump

FUNCTIONAL AREAS: Operations, Procedures, Procurement

PRICE-ANDERSON AMENDMENTS ACT (PAAA) INFORMATION

1. PRELIMINARY NOTICE OF VIOLATION FOR NUCLEAR SAFETY VIOLATIONS

On September 3, 1999, the DOE Office of Enforcement and Investigation issued a Preliminary Notice of Violation under the Price-Anderson Amendments Act to Los Alamos National Laboratory for nuclear safety procedural violations. The Notice cites the Laboratory for an event that led to a worker receiving unplanned and uncontrolled exposure and intake of radiological material. The Office of Enforcement and Investigation conducted the investigation. Investigators were concerned that radiological work control problems continued despite Laboratory managers' commitments to correct similar problems that led to an operational stand-down at the Chemistry and Metallurgy Research (CMR) facility last year. Investigators were also concerned about a subsequent glovebox overpressurization event which caused a glove to rupture and spread extensive contamination throughout a room. Fortunately, no radiological exposures occurred because no one was in the room during the event. Laboratory investigators identified a failure to follow approved work processes as a cause for the glovebox event. (NTS-ALO-LA-LANL-LANL-1999-0007, Letter, DOE [D. Michaels] to Los Alamos National Laboratory [J. Browne], 9/3/99)

The Office of Enforcement and Investigation staff identified multiple deficiencies and classified them as Severity Level II violations in the Preliminary Notice of Violation. Severity Level II violations are significant violations that demonstrate a lack of attention or carelessness toward safety that could potentially lead to adverse impacts. Investigators determined that these deficiencies represent potential violations of 10 CFR 830.120, *Quality Assurance Rule,* and 10 CFR 835, *Occupational Radiation Protection Rule*. The Notice describes (1) work process violations, (2) inadequate radiological instrumentation and monitoring in work areas, (3) inadequate radiological postings and access control, and (4) inadequate processes to prevent recurrence of quality problems.

WORK PROCESS VIOLATIONS

Investigators determined that the following work process failures were of concern because work was not performed in accordance with established administrative controls and approved procedures. Requirements to maintain personnel radiation exposures as low as reasonably achievable at the CMR facility were not developed, maintained, or implemented. The following violations were cited.

- A worker opened a can containing americium-241, removed the americium and the lead shielding from inside the can, and repackaged the americium without managers authorization to begin this activity. The removal of the lead shielding created a high radiation area.

- A worker handled the americium over several days without realizing radiological conditions had changed when the lead shielding was removed. Therefore, no one updated the radiological work permit to reflect the creation of a high radiation area, and radiological control technicians did not provide required continuous coverage when the worker was performing work in the high radiation area.

- A worker failed to stop work in accordance with safety practices and procedures when he realized that the can he opened was not empty as he believed before beginning work and that it contained americium and lead shielding. In addition, neither the worker nor his supervisor notified anyone that the can was not empty and that it contained radioactive material. The worker continued to handle the americium over several days without the appropriate work controls or monitoring, resulting in the worker receiving an intake of 0.8 rem committed effective dose equivalent and 12 rem committed dose equivalent to the bone surfaces. His personal clothing also became contaminated with approximately 56,000 dpm/100 cm^2 of americium because he did not tape the openings of the laboratory coat that he was wearing as required by the radiation work permit.

RADIOLOGICAL INSTRUMENTATION AND MONITORING VIOLATIONS

Investigators determined that the following radiological instrumentation and monitoring problems were of concern because no one performed area monitoring to document workplace radiological conditions, to detect changing radiological conditions, or to identify and control potential sources of personnel exposure. Specifically, no one performed radiological surveys over a period of several days when the worker was repackaging the americium. This resulted in contact radiation dose rates of up to 2,500 mR/hr for one can. In addition, after discovering that the worker and room had become contaminated with americium, radiological control technicians (1) used instruments to monitor work activities that did not detect gamma radiation, and (2) decontaminated the room without first performing radiation dose rate surveys.

RADIOLOGICAL POSTING AND ACCESS CONTROL VIOLATIONS

Investigators determined that personnel entry controls were not commensurate with existing radiological hazards for the room in which the can containing americium was opened. Specifically, radiological workers accessed the room in which the can containing the americium was being stored without knowing it was a high radiation are a because it was incorrectly posted as a radiological buffer area. In addition, appropriate personnel entry controls were not established during recovery operations because no one performed gamma surveys, which had not identified the high radiation area, until two days after recovery operations had started.

CORRECTIVE ACTION VIOLATIONS

Investigators determined that corrective actions from a previous CMR stand-down did not prevent recurrence. The previous stand-down occurred in September 1997 when several events were identified resulting from the performance of unauthorized work, the failure to stop work when work control conditions were exceeded, and the failure to follow procedures. Corrective actions were inadequate in that these same problems were identified for this event resulting in a worker becoming contaminated and receiving an unplanned, uncontrolled internal and external radiological dose.

Under the provisions of the Price-Anderson Amendments Act, DOE can fine contractors for violations of Department rules, regulations, and compliance orders relating to nuclear safety requirements. DOE contractors, who operate nuclear facilities and fail to implement corrective actions for identified deficiencies, could be subjected to Price-Anderson civil penalties under the work processes and quality improvement provisions of 10 CFR 830.120, *Quality Assurance Requirements*. These actions include Notices of Violation and, where appropriate, non-reimbursable civil penalties.

The primary considerations for determining whether DOE takes enforcement action is the actual or potential safety significance of the violation, coupled with how quickly the contractor acts to identify and correct problems. The Office of Enforcement and Investigation may reduce penalties when a DOE contractor promptly identifies a violation, reports it to DOE, and undertakes timely corrective action. DOE has discretion to not issue a Notice of Violation in certain cases.

The Noncompliance Tracking System (Weekly Summaries 95-17 and 95-20) provides a means for contractors to promptly report potential noncompliances and take advantage of provisions in the enforcement policy. DOE STD-7501-95, *Development of DOE Lessons Learned Programs*, discusses management responsibility for incorporating appropriate corrective actions in a timely manner.

KEYWORDS: radiation protection, enforcement, Price-Anderson Act

FUNCTIONAL AREAS: Radiation Protection, Nuclear/Criticality Safety, Lessons Learned

OEAF FOLLOWUP ACTIVITY

1. OPERATING EXPERIENCE WEEKLY SUMMARY NOW AVAILABLE VIA E-MAIL

The Office of Nuclear and Facility Safety is now able to send a .pdf version of the OEWS directly to you via e-mail. Here are just a few benefits you will see when you have an electronic copy sent “straight to your desktop.”

- ***Faster delivery.*** The OEWS will arrive in a fraction of the time it takes to get your current hard-copy version.
- ***Full color.*** Pictures, drawings, and charts are in full color, so you can copy and paste them wherever you’d like.
- ***Easily reproducible.*** You can forward the electronic OEWS file to others who might be interested in reading it, or you can print out black-and-white or color copies at your computer for distribution.

To take advantage of the new electronic OEWS, all you need is an e-mail address and a .pdf reader, such as the Adobe Acrobat Reader. Adobe Acrobat Reader is free and can be downloaded from the Adobe website at http://www.adobe.com/prodindex/acrobat/readstep.html.

Please fax or mail the Distribution Request Form in the back of this issue and check the "e-mail version" box provided. Or send your request, with "PLEASE ADD" in the subject line, to Christine Crow at ccrow@rpihq.com.